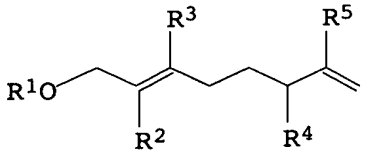
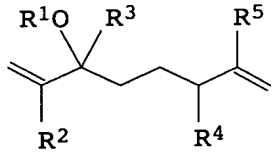
We claim:

1. A process for preparing alkapolyenyl compounds by homogeneously catalyzed reaction of 1-substituted alka-2,7-dienes of the formula I and/or 3-substituted alka-1,7-dienes of the formula II,



(I)



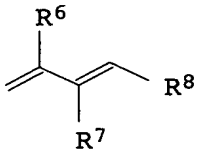
(II)

where

R^1 is hydrogen or C_1-C_6-alkyl, C_5-C_8-cycloalkyl, C_1-C_6-alkanoyl, C_6-C_{12}-aryl, C_6-C_{12}-aryloyl or C_7-C_{18}-aralkyl which may each be unsubstituted or monosubstituted, disubstituted or trisubstituted by hydroxy, C_1-C_6-alkoxy, C_1-C_6-alkanoyloxy and/or halogen, and

R^2, R^3, R^4 and R^5 are, independently of one another, hydrogen or C_1-C_6-alkyl,

with 1,3-conjugated dienes of the formula III,



(III)

where

R^6 and R^7 are, independently of one another, hydrogen or C_1-C_6-alkyl, and

R^8 is hydrogen, C_1-C_6-alkyl or C_2-C_6-alkenyl,

in the presence of at least one rhodium compound, wherein at least one cocatalyst is dissolved in the reaction mixture which cocatalyst is selected from hydrogen chloride, $GeCl_4$ and WCl_6.

2. A process as claimed in claim 1, wherein the reaction mixture consists of two phases, where one phase is liquid and the other phase is gaseous.

3. A process as claimed in claim 1, wherein the reaction mixture consists of three phases, where two phases are liquid and one phase is gaseous.

4. A process as claimed in any of the preceding claims, wherein hydrochloric acid is used as cocatalyst.

5. A process as claimed in any of the preceding claims, wherein the amount of cocatalyst is from 5 to 10^3 mol per gram atom of rhodium.

6. A process as claimed in any of the preceding claims, wherein, in addition, hydrogen is added.

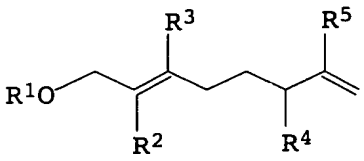
7. A process as claimed in any of the preceding claims, wherein, in addition, at least one organic halide is dissolved in the reaction medium.

8. A process as claimed in any of the preceding claims, wherein R^1 is C_1-C_6-alkyl, preferably methyl, or phenyl.

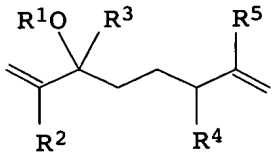
9. A process as claimed in any of the preceding claims, wherein R^2, R^3, R^4, R^5, R^6, R^7 and R^8 are hydrogen.

10. A process as claimed in any of the preceding claims, wherein rhodium(III) salts, in particular rhodium trichloride, and/or π-allyl complexes of rhodium, in particular bis(π-crotyl)tetrachloro(butadiene)dirhodium, are used.

11. The use of hydrogen chloride, $GeCl_4$ or WCl_6 as cocatalyst dissolved in the reaction mixture of the homogeneously catalyzed reaction, carried out in the presence of rhodium compounds, of 1-substituted alka-2,7-dienes of the formula I and/or 3-substituted alka-1,7-dienes of the formula II,

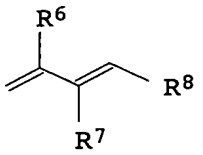


(I)



(II)

where R^1 is hydrogen or C_1-C_6-alkyl, C_5-C_8-cycloalkyl, C_1-C_6-alkanoyl, C_6-C_{12}-aryloyl or C_7-C_{18}-aralkyl each of which may be unsubstituted or monosubstituted, disubstituted or trisubstituted by hydroxy, C_1-C_6-alkoxy, C_1-C_6-alkanoyloxy and/or halogen, and R^2, R^3, R^4 and R^5 are, independently of one another, hydrogen or C_1-C_6-alkyl, with 1,3-conjugated dienes of the formula III



(III)

where R^6 and R^7 are, independently of one another, hydrogen or C_1-C_6-alkyl, and R^8 is hydrogen, C_1-C_6-alkyl or C_2-C_6-alkenyl.

12. The use as claimed in claim 11 in a process as claimed in any of claims 1 to 10.

13. The use of a mixture obtained by a process as claimed in any of claims 1 to 10 in the preparation of surfactants and detergents.